

ABSTRACT OF THE DISCLOSURE

A method of microwave assisted chemical reaction includes providing a microwavable reaction vessel which contains at least one material in a sample. The sample is heated by microwave energy to elevate the temperature of the reagent and at least partially volatilize the sample to establish a gas phase within the vessel followed by positive cooling of the gas phase to reduce the temperature and responsively reduce the pressure of the gas phase without effecting substantial cooling of the liquid phase. The method may involve employing cooling exteriorly of and adjacent to the gas phase containing portion of the vessel or cooling by means of a coolant flowing within coils disposed in the interior of the vessel or both. The process is preferably a continuous process. The apparatus may be a vessel transparent to microwave energy for receiving the sample. The vessel has space overlying the liquid phase containing portion for a gas phase. Structures for cooling means for positively cooling the gas phase to reduce the pressure of the gas phase without effecting substantial cooling of the reagent are provided. These structures for cooling may be contained within the vessel, exteriorly of the vessel or modification of the vessel configuration to facilitate gas phase cooling or combinations thereof. The invention also provides a method and associated apparatus for employing microwave heating and cooling of gases evolving from the heated sample in performing chemical analysis of samples. The invention further contemplates using such a system to purify samples.